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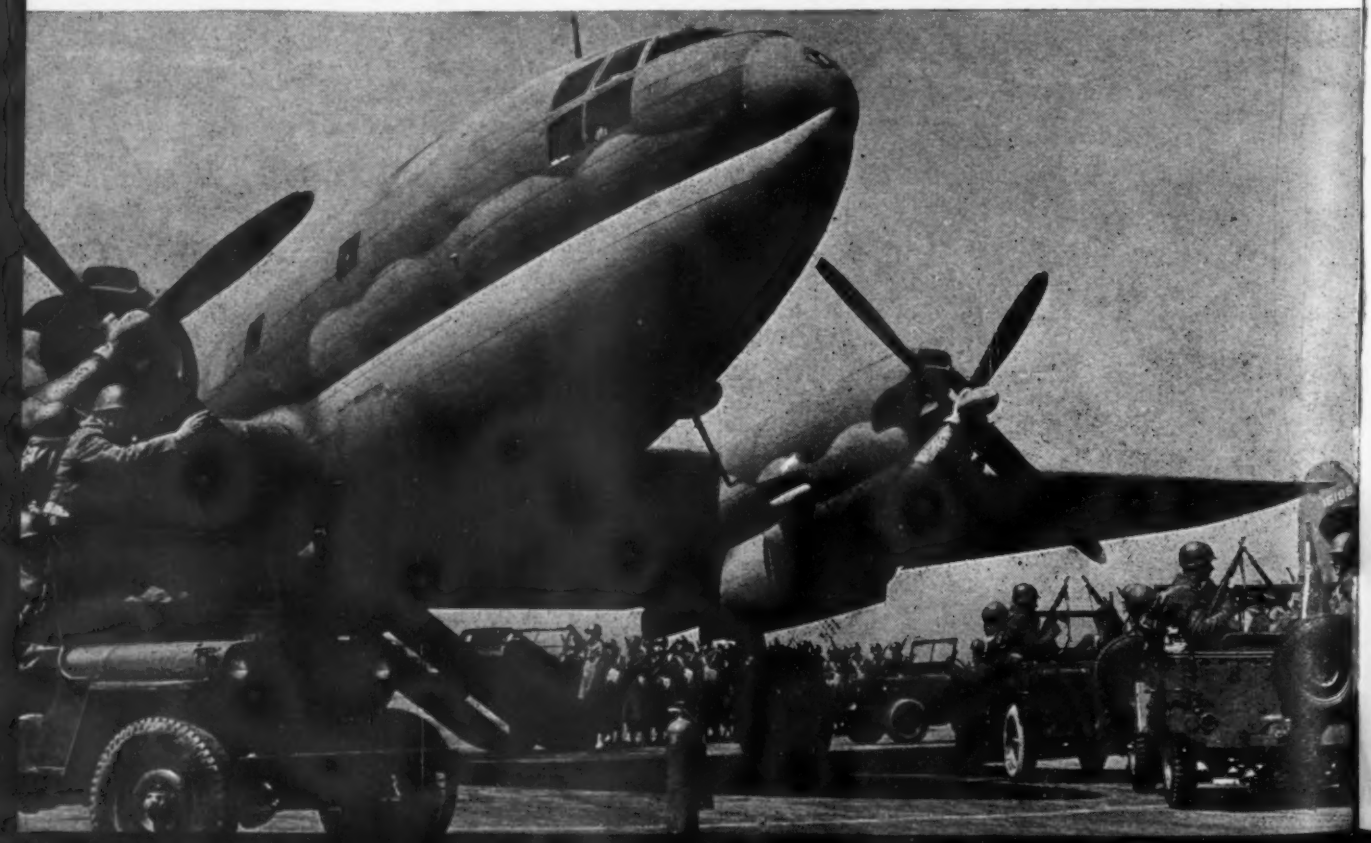

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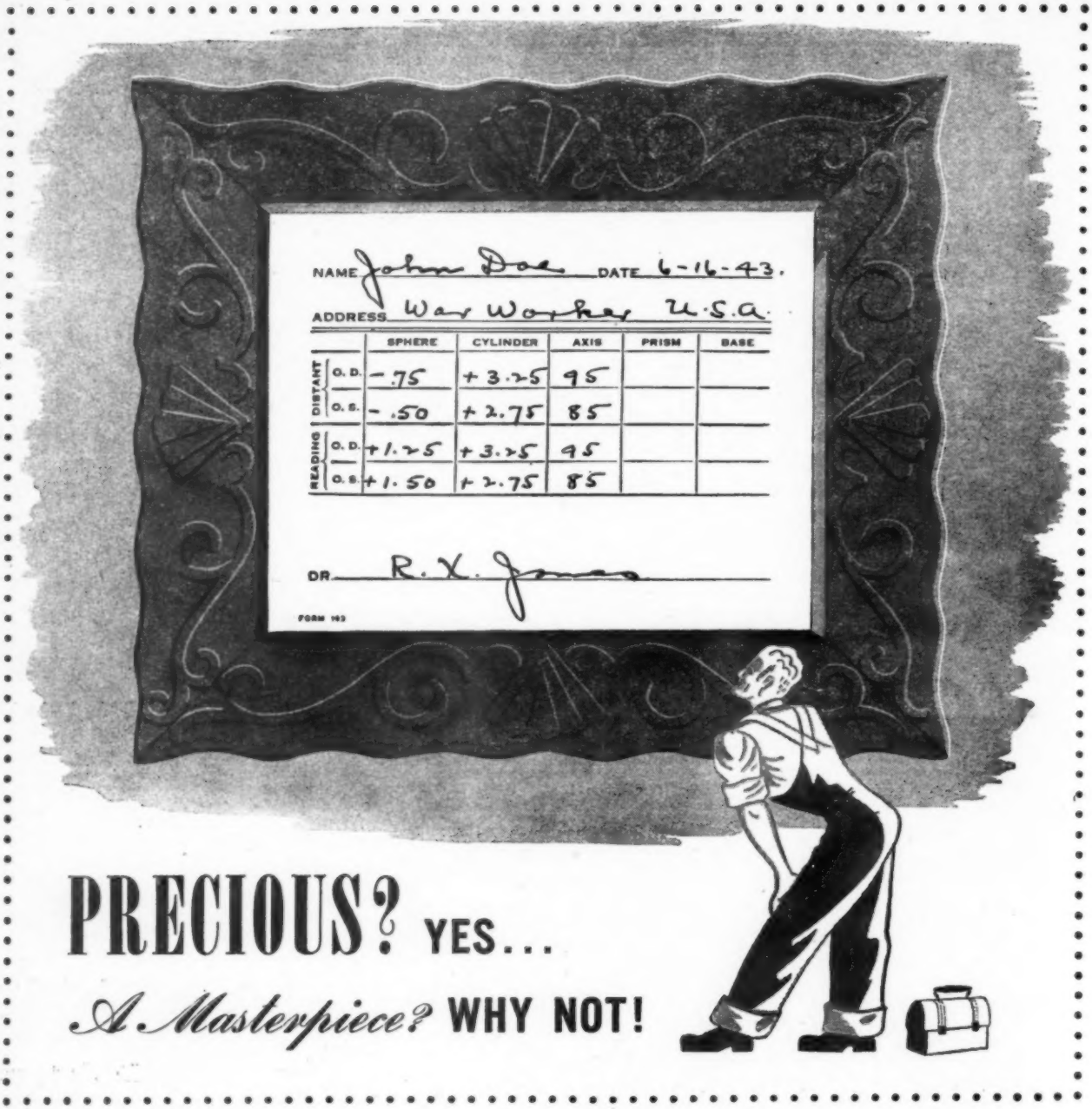
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OPHTHALMOMETRY THROUGH THE CORRECTION LENS OR THROUGH FORMULA?*

E. LeRoy Ryer, Opt. D., F. A. A. O.
and
Elmer E. Hotaling, Opt. D., F. A. A. O.
New York, New York

A certain amount of resistence against any basically new principle is to be expected. And it may be that the character of the resistence affords some measure of the intrinsic value of that principle. The studied attempt to avoid the real issue, that of actually estimating the *total* astigmia ophthalmometrically through the correction lens,[3] and to hurry the discussion back into the class room where troublesome practical problems may be so easily subdued by formulae, would seem to indicate that this particular basically new principle may have considerable potential value.

It is doubtful if any have placed more faith in ophthalmometry and made more earnest efforts to transform that faith into substantial utility than have the authors. That broad faith in ophthalmometry, however, was not permitted to hide certain specific limitations but by the same token theoretic orthodoxy was not permitted to smother potential practical values.

Ophthalmometry cannot be practiced by inflexible rule. No one has taken greater pains to prove this than Dr. Neumueller, who excoriated the Javal rule in order to make way for his set of tables. Sutcliffe's rule, held in high esteem by many, is little, if any, more dependable than Javal's. And McCulloch's, with undeniable value, is far from dependable except under generous tolerances.

Applying these rules to the actual diversified cases met in every day practice leads to the conclusion that they simply do not work if applied literally or strictly. This is so true that many, exacting definite guidance, reject ophthalmometry uncompromisingly. Let anyone prescribe strictly that which any of these rules dictates and he will risk losing many

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patients, if patients are lost because they cannot, or will not, tolerate markedly disturbing glasses.

Let it be emphasized that we are not dealing here with paired students in the class room; nor with formulae, however erudite, on blackboard or in textbook; nor with free clinic cases who must take what they get and like it (or discard it); nor with "controlled" experimental cases in the laboratory. But with patients in the examination room who, if uncomfortable and unrelieved, are not impressed by formulae, rules, and tables no matter how strongly we are convinced they are theoretically sound.

Let it be further emphasized that this is no attempt to underrate ophthalmometric formulae, rules, or tables which in their place, properly allowed for, are of unquestioned usefulness. But their place is not in this discussion of a practical method designed to dispense as far as possible with rules and tables based upon theoretical factors. If with any rule or table thus far promulgated a wholesome quantity and quality of common sense be not mixed, clinical ophtholmometry will prove anything but an unmixed blessing. So while using any theoretical means that can be used to advantage, let us not deny the patient the advantage that may accrue from any practical method just because the teacher is prone to condemn any unorthodox method that requires him to modify lecture notes used so familiarly through the years.

Abstract formula and concrete datum often conflict. This is inevitable. The theorist in the seclusion of the class room can afford to adhere dogmatically to his formula but the practitioner on the firing line in his examination room will be wise in extracting every bit of abstract theory or concrete rule-of-thumb which in any way helps arrive at more accurate refractive correction.

But our object is not to make any invidious comparison between theoretical rules and practical methods and we touch upon the former only because Drs. Cline[1] and Neumueller[2] try to take our method out of its practical class and condemn it because it does not jibe with their "theoretical considerations." Our object, obvious to the unbiased reader, is to help make ophthalmometry more useful in expediting optometric procedure and insuring more effective astigmic correction.

The authors offered a practical technique for applying ophthalmometry through the correction lens that seemed to them to possess some merit. They stated as clearly as they could marshal words to do so that

this technique was empiric; subject to the vagaries of the individual human binocular organism; very difficult in application clinically; not infallibly effective but sufficiently effective in empiric use by them to warrant scientific evaluation.

Instead of critically evaluating the technique as of possible clinical value in ascertaining data of practical value on living patients, Dr. Cline and Dr. Neumueller elected to ignore practical considerations and carry the issue back into the class room where they may deal with "theoretic considerations" instead of with the ophthalmometer, lenses, and the living eye in the examination room.

Dr. Cline's own words dispose of his criticism most effectively. He states: "Since the ophthalmometer is simply an optical device for measuring the size of a reflected image on the cornea, and since the laws pertaining to paraxial rays are of the most elementary form, it is not too much to assume that the readings obtained keratometrically should be very precise and quite independent of the 'vagaries of the human binocular organism.' With this in mind, the writer proceeded to derive the fundamental equations of the apparent corneal readings through a correction lens."

What do his own words disclose? One does not have to be very discerning to apprehend their deeper implications. They make clear that he did not test the technique but aimed to keep the issue on a theoretic basis proceeding, we consider it receding, to derive fundamental equations from *apparent* corneal readings on paper, never proceeding to get *actual* corneal readings through *actual* lenses placed before *actual* eyes. He states further: "Therefore if a lens could be placed at the cornea, the reading would differ by 1/3 the power of the lens added." Well, as he admits later on, a lens cannot be placed at the cornea and on that basis he may continue with his formulae while we will go forward trying to break away from abstract theoretic results that do not stand up in practice, in the hope of ascertaining ophthalmometric corrections that give more promise of standing up under actual use.

He adds: "Practically, however, lenses are placed not at the cornea but at some convenient distance as—14 mm. Our friends Ryer and Hotaling suggest—13.75; however, I shall not be as exact."

His gratuitous slur might better have been omitted inasmuch as it exposes, inadvertently, the weakness of his position on this practical

issue. He ridicules 13.75 but uses 14 mm in proceeding to derive his fundamental equations of the *apparent* corneal readings.

We object not only to the 13.75 mm, (which we did *not* use in our technique, although he attempts to create the impression that we did), but to his "convenient" 14 mm and to any fixed distance. Because any fixed distance works fine in a formula; but in practice lashes just will not grow to some one convenient length in all patients hence lenses, in practice, cannot be set always at 13.75 mm or 14 mm or any other pre-determined distance from the cornea. Therefore any correction cylinder arrived at by formula will be incorrect, by formula, to the extent it has to be set, in practice, one side of the other of this distance.

Dr. Cline ignored our clear-cut statement relating to the technique, which follows immediately the introductory remarks. We stated: "Step 2. The cylinder thus indicated was set, with its curved surface as close to the eye as the lashes permitted . . . "

To justify the incidental reference to 13.75 mm, we will have to refer Dr. Cline to Dr. Neumueller. Obviously, we recognize the necessity in practice of setting the correction lens as close to the eye as each patient's lashes will permit. We have set lenses anywhere from 9 to 15 mm from the cornea. Observing how frequently patients let there glasses slide a little away from the original adjustment we, just as practitioners, considered 15 mm a fairly good figure to use in theory. On that basis, throughout a manuscript on Ophthalmometry we used the figure 15 mm, theoretically, mind you, as the distance the correction lens would generally be worn from the cornea. That manuscript had to pass under Dr. Neumueller's scrutiny because at the time he was employed by those who were to publish the book. He made a point of changing our 15 mm wherever it was used to 13.75 mm. We assumed that 13.75 mm was the figure he used in making up his ophthalmometric tables, and as the difference was immaterial to us, we accepted his figure, and used it in that connection only in the present paper, as the context shows. The settlement of that point is a matter for the class room. We will continue, in the examination room, to set the actual lens as near the cornea as the lashes will permit. And, going beyond formulae, we will continue trying to perfect the technique which aims at ascertaining the correction of the *total* astigmia by direct application of ophthalmometry through trial lenses, instead of continuing satisfied

with estimating the corneal astigmia only by means of the ophthalmometer and formulae.

Dr. Neumueller's own words are, likewise, the best answer to his criticism. He, too, elects to take the discussion back into the class room, and keep it there. Witness his statement: "In the closing sentence the authors invite scientific tests on the procedure set forth in this article. Before making any tests it is always advisable to examine the premises upon which such tests are based. If theoretic consideration and previous experience should prove these premises to be wrong, the time and effort consumed by succeeding tests can be avoided."

An odd platitude from a scientist! His "if" insinuates much but proves nothing. The theoretic considerations he wishes to keep in are "out" as far as this admittedly empiric technique is concerned. He scraped off one barnacle—Javal's theoretic consideration that retarded progress, and we proposed scraping off all theoretic considerations and trying a direct practical method. Harping on theoretic considerations merely beclouds the issue. Theoretic considerations have failed dismally to place ophthalmometry on a firm practical footing. Instead of freezing it in that equivocal situation, just to protect pet theoretic considerations, is to deny ophthalmometry fair consideration from a practical viewpoint. We think that if some of these old inhibitions are cast aside the ophthalmometer may be used to better advantage as a practical, clinical aid. It is that practical phase of ophthalmometry in which we are particularly interested as, we hoped, were other practitioners.

Now, what he means by "previous experience" we do not know. We ran across nothing in the literature indicating that lenses had ever been used in ophthalmometry as we propose using them. Perhaps he did. And the U. S. Patent Office found nothing to offset our claims to the novelty of this method.

However, his point seems to be that it is not worthwhile to subject this practical technique to practical test. We still disagree and reiterate our closing statement: "Having conceived the principle, and carried the practice to its present state, the authors feel it is not out of keeping to urge that the technique as here proposed be now subjected to scientific test by those prepared to conduct such test, and either proved to be of no clinical value or carried to a state of clinical practicability."

This means a practical test of the technique on the human eye with

the ophthalmometer and lenses, with beclouding fundamental formulae and theoretic considerations laid aside for the moment.

Whether Dr. Neumueller could be sufficiently unbiased to make such a test as proposed may be judged by his closing words where he grudgingly, or perhaps unconsciously, makes a strange admission, as follows: "Incidentally, even if the procedure were correct, the writer believes it is so involved and clinically cumbersome as to exclude its application." In other words, he "would not like it even if it were good." And we might ask, incidentally, whether a test must be susceptible to slap-dash application or, if it afford unique diagnostic data, are we not bound to master its technical difficulties?

Having disposed of the criticism advanced to irrelevantly, and necessarily though reluctantly answered from that irrelevant viewpoint, let us refer the interested practitioner to the real problem as outlined in the March, 1943 issue of THE AMERICAN JOURNAL OF OPTOMETRY.

That problem, a purely practical one, is simply whether or not, in spite of relative difficulties of application and in spite of orthodox inhibiting theoretic considerations, this unorthodox practical method of applying ophthalmometry through lenses to estimate the *total* astigmia yields findings of tangible clinical value.

Not until such a technique has been actually applied clinically, and its findings actually tested by actual use on actual patients, can it be rejected or accepted on scientific grounds.

And whether this particular method be accepted or rejected it is hoped that it serves at least to break the spell that holds the ophthalmometer to be "simply an optical device for measuring the size of a reflected image on the cornea" and thus to open the way to its freer, broader development as a more clinically useful optometric instrument in the truly objective measurement of the total astigmia of the human eye.

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A NEW TRIAL SET FOR FITTING CONTACT LENSES*

Reuben Greenspoon, O. D.
Beverly Hills, California

A number of years of intensive work has been necessary to design a contact lens trial set that would make the fitting of contact lenses a simple and yet an exact procedure. For the past two years this experimental work was carried on by Mr. Emerich Rakos[1] and the writer.

Several hundred eye impressions and models were made. From these, eighty-five composite trial lenses were formulated. None of the scleral portions were based on geometric curves; but on actual eye curves. After fitting many patients with this large trial set, a careful check was made and it was found that 87% of the patients were fitted with but twenty-five lenses, and a trial set of lenses based upon these was devised. The other 13% required very odd shaped lenses. Although the impression system was tried on this 13% results were not good. This was due to the fact that some eyeballs were found to be soft and large and, therefore, lost their shape when the impression shell and material pressed on the eye. Also, too much error crept in because of expansion and contraction of materials and the altering of the eye models by technicians to give corneal and limbus clearance. Usually not enough scleral area is obtained in the impression to make possible good results.

This new trial set consists of twenty-five plastic trial lenses. Six lenses are symetrical, five lenses are asymetrical, seven lenses have the shorest radii vertical and four lenses have the shortest radii horizontal. Also included is one cataract trial lens for aphakic cases; one conical corneal trial lens and one very high minus trial lens. To fit the 13% a special trial set will later be available.

The patient is fitted in the following manner:

(1) Symetrical trial lenses are inserted with a 1½% sodium bicarbonate solution and the eyes are refracted. If the correction is over five diopters the distance from contact lens to back surface of trial lens should be measured.

(2) Careful inspection is made to see if the lens is large or small in diameter. See that lens does not extend into fornix (too large) or that the edges are easily seen (too small).

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[1] President, The Invisible Lens, Inc., 501 Madison Ave., New York City.

If the diameter is correct then check radius. If the radius is too small edges will fit tight on sclera and will retard circulation of surface vessels. This can be easily seen by following the course of the vessels as they pass under the lens margin. If the radius is too large lens edges will stand away from sclera.

(3) If lens rests lightly and evenly all around then remove it and reinsert with a mild fluorscein solution (one drop of 2% solution in a contact lens filled with bicarbonate solution).

(4) If symetrical lens fits horizontally but is loose up and down then use lenses having short vertical radii.

(5) If symetrical lens fits vertically but is loose horizontally then use lenses having short horizontal radii.

After inserting the second lens with fluorscein and using a cobalt blue flash light or a Strobalite, you can immediately tell whether the next lens should have a larger or smaller radius. The lens must give ample corneal clearance and should clear about 3 m/m beyond limbus. You will find that, because of the special construction of these lenses, limbus clearance is easily obtained. Also lens should rest evenly on sclera on about a 3 m/m resting band without compressing the blood vessels. When you have inserted a lens that fits in this manner your patient will invariably say that the lens feels good on the eye. A patient who will permit you to insert and remove trial lenses without anaesthetic will usually tolerate the finished lenses well.

All that is necessary after that is (1) make a horizontal line on scleral portion of lens with a red Blaisdell cellophane pencil No. 965. Place a dot on center of pupil. (2) Make a series of dots around the outer iris margin. Do same at end of the fluorscein band. (3) Mark spots that are to be tightened or loosened or where additional clearance is necessary. Mark the places lens extends into fornix and ask to have that portion cut away. If lens does not cover enough of eye ball request a larger lens and state size in milimeters. A lens order sheet is available for this purpose. (4) Before lens is removed from eye make a rough drawing of lens and mark on drawing what changes you wish. After the lens is removed you may dry the inside and trace your red marks with India ink. After the ink has dried pour dental stone into your trial lens. After the dental stone has hardened all the India marks will be on it. You may either send this plaster model to the laboratory or, if you do not care to make this model and can spare the trial lens, then send

it with its original markings. The technicians at the laboratory will make the corrections you indicate. The writer's experience with them for the past two years has been good.

If the optometrist wishes he may alter the plastic trial lens as indicated in the trial set manual. Should the trial lens fit well the correction will be ground into that very lens and a new trial lens will be sent to replace it. If, for some reason, the optometrist wishes glass lenses, these can be made just like your model or plastic trial lenses.

When you receive the lenses check them as to correction and fit. Should changes be necessary the same procedure is used as in marking the trial lenses. The laboratory will take care of necessary changes and return the lenses in a short time. If the correction is proper but only minor scleral changes are needed the optometrist may make them by following instructions in the manual or he may return the lenses to laboratory. After the plastic lenses are finished the corneal sections may be tinted to any desired color.

THE EXTRA-OCULAR MUSCLES: AN INTERPRETATION OF THEIR FUNCTION FROM THE POINT OF VIEW OF VISION*

H. Elliman

In a previous paper[1] the writer endeavored to show that the physiological treatment of vision without proper regard to the psychological requirements, as is the vogue today, can no longer be maintained with safety; and that a more comprehensive working hypothesis, more adequate to our needs, is essential.

It was suggested that the adoption of the psychological point of view would do much to remove the danger of stagnation which was becoming more and more apparent; and the hope was implied that by this means also we might manage to deliver ourselves into a larger world where a period of growth and development would again become possible.

The argument was supported by a comparison between the physiological and the psychological descriptions of vision, and an effort was made to show that the new point of view, hitherto regarded merely as a duplicate of the already sufficient physiological plan and therefore unnecessary or redundant, appeared to hold the solution to many of the tantalising problems which we find with us today and in which the physiological plan has so far been powerless to assist.

In the course of the paper it may have become obvious to many that there are certain aspects in the new point of view which appear to be greatly at variance, if not directly opposed to the orthodox and accepted point of view, and that these required some further elucidation. It is therefore the purpose of this paper to attempt to clear up some of the misunderstandings and to give the explanations of them, so that it may become possible for us to adjust ourselves to a better understanding of both the physiological and psychological points of view. The close agreement in function between the physiological and the psychological plans which is demonstrated in the living structure requires also that we recognize a similar agreement in our understanding of them.

But we must constantly bear in mind that their functions are complementary in their natures and not, as is popularly supposed, identical or interchangeable; and that the one in operation cannot be described in terms of the other.

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* An abridgment of the material appearing in the Refractionist, Vol. 28, No. 497.

[1] H. Elliman. Binocular Perspective. Refractionist. February, 1939.

For instance: Simply because it is the purpose of the extra-ocular muscles to rotate the globes in many different directions it should not have been presumed that for the same reason, and as a natural corollary, their function is also to determine thereby the direction of the field of vision in order to present many different views. This is an example of the line of thought which follows when physiology is permitted to exert an undue influence in matters which are outside its own immediate sphere.

The extra-ocular muscles have no such function at all, and the reader will be well aware of this in the example of what he is doing at this very moment. He will observe that despite the continuous side to side movement of his eyes the field of vision appears to remain stationary and that it is his own point of attention which is moving. It is true that the optical images are caused to swing from one side of the retinas to the other with such ocular movements but this fact does not also include the proof that the visual field must therefore swing about sympathetically in space. The optical images are not "stuck" on to the retinas but simply move across them and provided that the visual image of the optical aperture (i. e. the oval-shaped boundary to the visual field) does not suffer modification by intrusion of the rims or projections of the orbits, the visual field remains constant and its relative position unchanged.

In ordinary use of the eyes rotation does not effect any apparent change either in the direction or extent of the binocular view except in the extreme positions where a slight gain of rather doubtful value is obtained, but little advantage is taken of this because of the high degree of directed mental effort and muscular strain which is involved. It is found much more convenient and profitable to move the head. In the position of rest the binocular view extends about 180° horizontally and rotation of the globes through 45° to the extreme position merely brings about 10° of a new field into view, the remaining 35° or thereabouts being effectively screened by the outer fleshy rims of the orbit. Against this there is the actual loss of 45° on the side of the view opposite to the direction of rotation, so that there may actually be a reduction in the extent of the binocular field when the globes depart from the position of rest.

It would appear from this that the possession of the extra-ocular muscles is of very little benefit so far as the direction or extent of the

binocular view is concerned and that little use is made of them for this purpose. From observation we find that this is so. It has been observed that ocular movements are for the most part confined to within small angular limits on each side of the median line so that the ordinary use of the extra-ocular muscles does not affect either the direction or extent of the binocular view; and it may therefore be said that so long as the head is unmoved the angular limits and direction of the visual field remain substantially constant regardless of ocular movements, and the senses, of course, likewise remain unaffected.

The obvious question then arises: What is the purpose of the extra-ocular muscles; to what use are they put? Before we can consider the question properly we must first take up the proper point of view. What does vision require of the extra-ocular muscles? Now it will be appreciated that we do not *look* wth the eyes, we merely *see* with them; and in order to *look* we must make use of the eye which is within the eye, i.e. the macula. Putting this together in another way we may say that the retina *sees* but the macula *looks* at what is seen on the retina, and the nature of the problem becomes somewhat clearer. Now, the retina makes little use of the extra-ocular muscles simply because it gets much better value from the muscles of the neck; the macula, on the other hand, if it is to be effective in its purpose, has great need of such muscles that it may be enabled to be directed speedily and conveniently upon any desired point in the field of view which may at that moment require the special attention of conscious vision. We may therefore reasonably assume that the extra-ocular muscles, whose anatomical construction and physiological operation are subservient to psychological requirements, are adapted to the needs of the macula rather than to those of the retina, and that their purpose is to enable the macula to traverse the relatively stationary optical image on the retina along a path directed towards a desired point of attention in the visual field, which purpose they are suited to perform in a more exquisite and precise manner than are the muscles of the neck.

But what of Convergence? In some strange manner of reason this special function of the *internal recti* has come to be regarded as associated and essential to the phenomenon of single binocular vision, and it is thought that by bringing about convergence of the physiological axes of the globes the resulting change in the disposition of the optical images on the retina effects a corresponding change in the disposition of the

stimulated areas on the brain, and that the stimulation of two such corresponding or coincidental areas on the brain reconciles the two somewhat dissimilar sensory patterns formed thereon, to excite one single visual image from out of them. The process is referred to as "fusion," and the effects of parallax which attend binocular vision are thought to be overcome in this process so that the mind is enabled in this manner to perceive one single visual image instead of two. It is also thought that because of the double sensory pattern which is conveyed from the retinas to the brain, double vision must inevitably ensue in the absence of "fusion."

The writer does not agree with this view. Simply and for no other reason, that we have two somewhat dissimilar optical images upon the retina, and that each of these images is transmitted individually, is not in itself sufficient reason to warrant the assumption that we should for that reason see double. It is hardly a reason at all, and certainly not a scientific reason. And in any case, even if it were true that we do see double and some physiological means were therefore to be essential to enable us to see single, then convergence would not be of even the slightest assistance to us in the matter. A simple mathematical analysis will suffice to show that convergence is powerless to engage itself with the problem of parallax, and a moment's consideration to show that no possible disposition of the globes can bring about any happy similarity in the optical images upon the retinas or in the dispositions of their sensory patterns on the brain such as would be required to effect their fusion. There is only one physiological "solution" which would be in a position to bring about such a condition—that of drawing the globes together so that their separation would be to nill and that, of course, is both physiologically and physically impossible. So if it were true that two individual sensory patterns must give rise to two individual visual objects then we would be forced to give the situation up as a bad job. For, so long as the P.D. remained we would be obliged to submit to double vision, convergence or no convergence; and were it even possible to pull the two sensory patterns together bodily into alignment or coincidence on the brain, no fusion would still result from it since alignment at one point must inevitably result in a greater discrepancy at another. One other possibility now remains, that of a means which provides a form of variable distortion or re-adjustment in the mind to enable the two dissimilar sensory patterns to be visualized as one visual

object, but the idea of this is so repugnant as to compel its dismissal.

Now, there is no justification for presuming that Nature had blundered in the first place by providing us with two eyes which did not enable us to see twice as far or twice as good, but which only gave us two dissimilar impressions, one of which hindered and confused the other; or that having done so was unable to retrieve her steps and was obliged to devise a means to neutralize the defect so that we should be happy ever after with the inferior condition of monocular vision—for that is the condition which attends the arrival of two similar sensory patterns on corresponding or identical areas on the brain. Fortunately there is no such defect in binocular vision and consequently no need for any remedy.

The plane optical images on the retinas and their visual counterparts may or may not be identical, it is of very little consequence. What *does* matter is the psychological point of view. There is no necessity whatever for any physiological operation to effect coincidence or similarity in the optical images or their visual counterparts, because normally there is no double vision. This may appear somewhat startling at first but will become more rational with the explanation which will be given. The confusion arises in regarding the two two-dimensional aspects (i.e. the two visual images) of one three-dimensional object as two distinct visual objects. We have not sufficiently distinguished between the visual object reconstructed in space and the two visual aspects of it. It will be appreciated, and without any profound knowledge of solid geometry, that at least two two-dimensional aspects are required (essential) to the formation of a three-dimensional figure. In the case of vision the two aspects are ensured by the separation of the globes. Parallax as an essential factor is then entered into each visual image along with the other factor of the visual angles under which the various shapes or configurations which make up the visual field are seen; and it is most essential that these factors be maintained wholely and without any modification whatever if the three-dimensional visual object is to be correctly reconstructed.

Consider for a moment the light rays radiating outwards from an external source and becoming projected by means of an optical arrangement upon two screens separated by an interval; and imagine that the process has been reversed and that these two projections have been made to retrace their respective paths their corresponding bundles of rays again

to meet in space. It can be shown by geometrical figure that the pencils or bundles of rays from each corresponding point on the projections would meet to describe at their junctions in space an exact replica in shape, size and contour of the face of the external body which was the original source. The parallactic displacements in the projections become neutralized on the return journey and coincidence is effected at their junctions.

A scheme of this nature has a very strong appeal, and there is much to recommend its adaptation to vision; for now fusion of the visual images can conveniently be obtained at all times and under all circumstances in a direct, convenient and natural manner and without the necessity for any special physiological process for that purpose. It is simply required to understand that the visual images are always of necessity coincident *in space*. The theory is simple, clear and concise. There is much to recommend it. At least it is more reasonable than to presume that all living creatures with the possible exception of man and a few monkeys have been endowed by kind-hearted Mother Nature with the blessing of everlasting diplopia. And since there is no recorded instance of a tiger starving to death because he kept leaping on to the wrong goat, or of a fox rendering himself unconscious by running into hiding between two trees when only one was there, the writer is strongly inclined to the theory that binocular vision, automatically and without any special physiological provisions for that purpose, normally embodies all the qualities of vision in three dimensions after the manner described above; and that convergence has nothing whatever to do with it.

What, then, is the purpose of convergence? In considering the special function of the *internal recti* to effect a convergence of the physiological axes, we are forced to take up the new point of view; there is no alternative, for having regard to what has been said above, the physiological plan is no longer tenable. We are agreed (I hope) that convergence has no means of coming to grips with parallax such as would allow the reconciliation of the optical images upon the retinas or in their sensory counterparts on the brain or in their visual complements in the mind even if it *were* necessary. We may take it that convergence is not a physiological absurdity.

Let the reader imagine for the sake of the illustration the dilemma of a person having bi-macular vision but without any convergence. Owing to the natural fixed disposition of the globes it would only be pos-

sible to obtain bi-macular coincidence at one particular distance only, and as this particular interval was departed from, two entirely dissimilar images would occupy the macular areas and rotation of the globes would bring the point of attention to one macula only, but not to the other, with the result that two entirely dissimilar images would again occupy the maculae. Now the macula is the receptive area on the retina which has become specialized for the particular purposes of conscious and directed vision; and dissociation of the bi-macular images is an intolerable condition, for attention will not suffer itself to become divided upon two different matters. This difficulty which arises in the special or peculiar nature of macular vision is overcome by means of convergence. Where convergence is impossible and the maculae are stimulated by two incongruous or irreconcilable images a rivalry ensues for the undisputed tenancy of central vision until one of the macular images is forced to yield to become inhibited and fade from vision, leaving the other to remain.

In diplopia, as it is generally understood, the false image falls upon the retina and therefore both the true and the false image may be seen; but diplopia, as bi-macular diplopia, does not exist and one or the other of the macular images must give way.

Let the reader view two cards in a stereoscope, one having a small circle made up of a group of closely spaced vertical lines and the other a similar circle of closely spaced horizontal lines. Their macular images being irreconcilable it will be found that as attention is directed upon one group the other will become inhibited and fade from vision. There may be a coming and going of the images in turns for some short time but eventually the contest will be decided and one of them will be forced to retire. In certain cases, especially where the lines are not spaced closely enough for the observer's particular case, both groups may be seen as if superimposed, but one of them will appear to be broken at each of the intersections of the vertical and horizontal lines. In no case will the images become completely reconciled to appear in the form of a true mesh as would be the case if each card carried both the vertical and horizontal lines.

It is of interest to note in passing that there is no "hole" left in the visual field as a result of one macular image being abandoned. The visual field is self-sealing and this will be understood if the picture of *one visual object in space* is kept in mind. It might therefore be expected that if a person were for some reason to become blind on *one* macula only (sight

remaining otherwise normal) he would remain in ignorance of his deficiency, since the space image would be normal and direct vision would be obtained with the one remaining macula. The writer believes that such a case has been recorded but is unable to quote at the moment. A warning must here be given against jumping to the conclusion from what has just been said, that there is no advantage in having two normal maculae. We may rest assured that there certainly is some advantage, but what the nature of it may be is not clear; perhaps we have become so accustomed to it that it is likely to continue escaping our efforts for some time to come.

Now the excursions of the globes, or rather the excursions of the macula in the optical image, have been dealt with and it would appear that the sum total of purpose of the extra-ocular muscles is to provide a means whereby the maculae may become enabled to traverse the relatively stationary optical images on the retinas along two paths directed together towards a common desired point of attention on an already fixed and single space image; or in another way more suited to the new point of view, that the sole purpose of the extra-ocular muscles is to provide a physiological means to enable, as near as may be sufficient to meet the psychological requirements, the attention to be directed undivided upon a point on the visual object which may require the special attention of conscious vision.

But this is not the only purpose of the extra-ocular muscles. The extra-ocular muscles serve a very useful purpose in compensating for, or counterbalancing the effects of, body movement; and without them central vision would blur with the slightest movement of the head. The comparatively high time lag in either the response of the retinal cone, its transmission to the brain or its appreciation in the mind renders the macular image pattern liable to blur or confusion. The effect will be seen by fixing attention on the finger-nail as the finger is moved down this column of print. It will be observed that macular vision requires the field of view to be arrested (peripheral vision, on the other hand, appears to be better suited when the field or a part of it is in motion). This too, appears to support the conclusion previously arrived at, that the extra-ocular muscles are adapted to the requirements of macular rather than peripheral vision.

Now, if this description and account of the extra-ocular muscles is correct there are several very interesting speculations which arise out

of it, in which matters Comparative Anatomy can be of great assistance. They are given in the hope that they will awaken some interest.

The following speculations may be expected to exist in fact if the theory outlined in this paper is true: (1) That there are two terminal areas on the brain, one for each retina, which are adjacent or interposed but always separate and distinct in their operation. (2) That the presence of extra-ocular muscles demonstrates the presence of a macular patch on the retina of that eye, except in the special case where the globes are so set forward and their physiological axes so disposed that rotation provides a new direction of view. (3) That the development of the extra-ocular muscles progresses step by step with the development of the macular patch; or in the special case mentioned above, with increase in the potential extent of the view. (4) That the angular limits of rotation of the globes is inversely proportional to the angular size of the macular patch in the same meridians and likewise directly proportional to the angular limits of the field of view; and again, in the special case, that the angular limits of rotation are directly proportional to the available extent of view and inversely proportional to the angular size of the optical aperture. (5) That where the globes are so set forward that the field of view can suffer no obstruction from the outer rims of the orbits the centre of rotation will depart from the geometrical centre of the globe and in a definite relationship, that a better advantage might be obtained in the ocular movements. (6) That as the extent of view becomes restricted either because of obstruction by the outer rims of the orbits or because of the disposition of the physiological axes towards parallelism a higher degree of cooperation with the muscles of the neck develops. There are many offshoots from these speculations, but for the moment the writer recommends those given to the earnest consideration of those who are fortunate enough to have the special facilities to pursue them.

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THE LIONEL TOPAZ MEMORIAL LIBRARY OF VISUAL SCIENCE

July 23 marked the first anniversary of the passing of Lionel Topaz, who, for more than thirty years, had made significant contributions to the development of visual science. As editor and publisher of optical, optometrical and ophthalmological journals and books, he had played an important part in the dissemination of knowledge concerning the applications of optics and visual science to the problems of human vision.

His daughter, Mae, and his sons, Oscar and Martin Topaz, have sought to erect a memorial to their father that would adequately and fittingly reflect their father's devotion to visual science and inspire others

to carry on the work of further development and application to human needs. They have chosen, therefore, to provide for the continuation of the life-long interests of their father by the gift of funds for the establishment of The Lionel Topaz Memorial Library of Visual Science to become an integral part of the Sheard Foundation for Education and Research in Vision of the Ohio State University at Columbus, Ohio.

Furthermore, in choosing this particular memorial, they have given recognition to the close friendship which existed for many years between their father, as an editor and publisher, and Charles Sheard, as an author, educator and research worker.

As more far-reaching and enduring for generations to come, and as far-exceeding the desire to perpetuate the name of an honored father, the Topaz family portrayed the fundamental purpose of their selection when they stated, in a document transmitted to the Sheard Foundation in the closing days of 1942:

"It is our purpose to establish and assist in the development of a library of books and periodicals pertaining to all phases of visual science, including physics, chemistry, physiological and geometrical optics, physiology, anatomy, pathology, illumination, visual psychology and other educational avenues devoted to or concerned with the study of vision."

President Howard L. Bevis of the Ohio State University, in accepting the gift, said:

"The Ohio State University pays tribute to the memory of the man whom this gift honors and to his daughter and sons in seeking to perpetuate the name of their father through this memorial library of visual science. The University feels that this memorial will assist and inspire others to carry on with the development of visual science to which Lionel Topaz gave his devotion."

Ewing Adams, O.D., President of the American Optometric Association, said: "It is a very laudable desire of man to live on in the memory of his associates, and to pass on to posterity some evidence of the endeavors with which he has been concerned and into which he has put his life interest and his life blood.

"It is an equally laudable desire of a family that the family name live on, for the family naturally has pride in the accomplishments of its members.

"As I have said, these are very laudable desires, and man has and

will continue to build memorials in order that his memory may be carried on to posterity. Some of these memorials will be of stone and other materials that exist for generations to come; some of these will be the products of the skill of his hand and of his brain; some of these, perchance, will be the collections and acquisitions of the things with which he has been associated.

"So the Topaz family—Mae, Oscar and Martin—have chosen to humanly immortalize their father through the medium of the printed pages and the volumes devoted to the things of vision.

"It is indeed fitting and proper that this Lionel Topaz Memorial Library of Visual Science should become an integral part of the Sheard Foundation for Education and Research in Vision, for this is a great educational movement looking toward the development of the finest types of teachers and preachers of all things visual, the search for the truth and the glory of the struggle of wrestling from nature a knowledge of her secrets, particularly insofar as they are concerned with vision.

"Indeed it is fitting and proper that this association, the American Optometric Association, should express its great appreciation of these contributions to the things that concern vision in all of its phases, and should pay tribute to the memory of one of its members, Lionel Topaz, who did so much through the medium of the printed page to disseminate information concerning vision.

"His life and the memorialization of him by his children should act as a stimulus to all to serve our age and generation to our full capacity, and should engender interest in the perpetuation of the profession of which we are a part."

The Academy too joins with the profession in its tribute to the Topaz family for this excellent memorial to Lionel Topaz. The Sheard Foundation at the Ohio State University will become one of the great shrines of Optometry and will also serve as a focal point in the further technical development of all refractive procedures. Such a library at the foundation which is now to become a reality is one of the finer things to which the profession can turn when the war comes to a close.

CAREL C. KOCH

OPTOMETRY'S PART IN THE WAR ON INFLATION

During World War I, prices got out of control. Governmental

experts tell us that inflated prices added more than 13 billion dollars to the cost of the war.

As many optometrists will remember, when the war was over, prices fell disastrously. Losses fell on business and agriculture, on professional people, wage earners and on investors. A great many people on farms and in business were ruined. We Americans could have avoided those losses if all of us had acted boldly and in proper time.

That is why price control is necessary today and why every profession and every business must help assist our government in this regard. Our price regulations, now established in every field, will help us maintain our practices and our homes.

In World War II we cannot afford to lose the fight against inflation. By prompt and resolute action we have a chance to control the rise of prices for services and commodities in this country. This is necessary if only to protect the economic foundations of the war effort. Serious inflationary trends might be a more serious defeat for us than the loss of a major military campaign. And there is far less excuse for it, because it is within our power to control, in a great degree, inflation.

In World War II, instead of 13 billions, inflation would and could easily cost many times that amount. In fact we are told it could easily double the total cost of the war.

At the present time every profession, every business and every trade has been mobilized and is on the front line of the war against inflation. Optometry has its important part to play in this fight. It is our patriotic duty as optometrists to study and understand the price regulations as they apply to ophthalmic materials so that we can all do our part in this important fight against rising prices. In this our government has every right to expect our fullest cooperation.

CAREL C. KOCH

SPECIAL REPORTS

THE BETTER VISION INSTITUTE LOOKS AHEAD TO THE WORLD OF TOMORROW*

M. J. Julian,[1]
New York, N. Y.

Some day soon the war will end. The world cannot go on destroying itself and burning up fundamental values at the colossal pace which prevails today. When this day will come, no one knows for certain. Many have dared to predict. One prominent citizen has been bold enough to prepare and distribute a chart which states that the German collapse will occur in October of this year and that the Japanese collapse will occur in October or November of 1944. Of course, this is sheer guess work. No one, not even the insiders, can possibly determine these dates on any certain basis. When the end does come, however, great changes will take place along all fronts of civilian life.

Almost immediately the national government will be faced with the problem of drastic curtailments; armies of men will be returned to civilian life—and the hunt for jobs! One estimate is that this trek back to civil activities will be at the rate of 700,000 men a month! War contracts will be cancelled on every hand. Spending will stop. Work will stop. Incomes will stop in thousands of cases, while in thousands of others cuts will be in order. Not permanently, but certainly for the time being or until industry can catch its breath and tighten its belt from the shock of war order stoppage and the conversion to peace-time activities. In all probability, these peace time adjustments will be made with miraculous speed. This seems certain in order that American industry and American employment may survive.

Consequently, right now, today, plans and blue prints and molds for the peace-time world of tomorrow are already drawn. Great industrial leaders have seen to this. Many optometrists are undoubtedly familiar with the COMMITTEE FOR ECONOMIC DEVELOPMENT which has already been set up by important business leaders under the generalship of Paul G. Hoffman, President of the Studebaker Corp. This Committee

* Submitted on June 10, 1943, for publication in the September, 1943 issue of AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

[1] President, Better Vision Institute.

is now in process of doing an extensive county by county organization research and planning job in an effort to prepare for the post-war period. And so, too, individual leaders in American industry are similarly planning for their own companies. New products, new plans, new promotions will start long before the war ends. Industry cannot afford to wait until the final day. They must be prepared to promote and develop and convert before the last gun is fired.

There are great problems to be solved in the reconstruction days ahead. The world must be fed, clothed, re-built. And America will be the focal point for all the new activities of the world of tomorrow. For here are the creative genius, the manufacturing skill and the productive resources and transportation facilities second to none in the whole world.

What are some of the prospects and problems of this new world of tomorrow? Let's list a few:

(1) *The American Family.* To start at the beginning, let's consider the American family. In 1910, there were a little more than 20 million families in the United States. In 1940, there were about 35 million families—an increase of 72%.

(2) *Our National Income.* In line with the growth of the American family, there has been a similar spectacular growth in the national income. In 1910 the total income in the United States was a little over $28 billion. In 1942 it was $117 billion—an increase of 317%.

(3) *Income Per Family.* In 1910 the income of the average American family was $1,380. In 1942, it was $3,370—an increase of 144%. Moreover, one forecaster dares to predict that this family income will reach a high point of $6,200 by 1945, as the result of the expanded national income and the leveling forces which have been at work in the United States for the past several years.

(4) *Income Distribution.* In 1910, 69.4% of all American families had less than $20 a week for all needs. In other words, 7 out of every 10 families in the United States had incomes of less than $1,000 a year. 29.4% had incomes between $1,000 and $5,000 while the balance of 1.2% of families had incomes in excess of $5,000.

(5) *Family Spending.* It is estimated that today these lesser income families account for: 75% of all food purchases; 75% of medicines and drugs; 70% of all personal and professional services; 79% of autos, and 77% of homes.

Eric Johnston, President of the U. S. Chamber of Commerce, says: "We'll have the greatest pent-up demand for consumer goods after the war that has ever existed in this country," and adds that the American people are already planning to buy over two and one-half million autos, nearly 2 million refrigerators, 1¼ million washing machines, a million and a half radios, as well as hosts of other commodities that make for a higher standard of living.

An associate of Mr. Johnston's at the U. S. Chamber estimates that already there are approximately $17 billion ready to go to market when the war ends and commodities once again are available.

(6) *Public Works Program.* This program will be speeded promptly to take up the immediate shock of the war work slack. Public road building with its kindred industries will boom. There is now a backlog of $10 to $15 billions of building in this direction.

(7) *Home Building.* Here, again, in this field the slack from lack of war work will be taken up in large measure. At least a million new homes will be required each year for the next several years at least. Real prefabricated houses will boom, especially in the smaller house categories. These houses are already way beyond the blue print stages. In addition, vast quantities of building materials will be shipped abroad for the vast reconstruction programs to be carried on there.

(8) *Rationing.* In all probability, rationing will continue at a diminishing rate throughout the years 1944 and 1945.

(9) *Feeding.* Much world feeding will devolve upon us for at least two years after the war.

(10) *Wages.* Labor will fight for the maintenance of a high wage level. Wages are bound to be higher than pre-war and in all probability will not sag too much from present levels. Neither will prices.

(11) *Labor Unions.* These will expand in all directions, but be under more rigid control.

(12) *Living Standards.* Beyond a shadow of a doubt, the American standard of living will continue to go higher and at the same time it will have a strong influence on the living standards in all parts of the world.

(13) *Air Transport.* Among the forces that will make this higher world standard of living possible will be the new air industry of the future. Air transport of passengers and freight will gradually take up

the huge production facilities in this field which have been built up by the war needs. Already, we are out-producing the rest of the world combined in aircraft.

(14) *New Motor Cars.* Likewise, the automobile of the very near future will prove to be a miracle of performance. It will be new from stem to stern; half the weight as formerly and providing forty to fifty miles to a gallon of gas. As time goes on, these autos will learn to fly as well as roll. Here, too, this development has left the blue print stage. . . . *Plastics . . . Rubber . . . Electronics . . . Refrigeration . . . Dehydration . . . Light Metals . . .* All these industries of the future will open up tremendous opportunities and create untold wealth.

(15) *Social Security.* Socialization programs of all kinds will be expanded in every direction under *any* form of political set-up that may exist after the war. This development is inevitable. Already, plans have been drawn in Washington and aggressive steps are now being taken for the fulfillment of these plans. To facilitate the trend in this direction, industry as well as the professions are already taking the initiative to prepare and sponsor their own programs which are aimed to care for the health needs of those in the lower income brackets. Miss Frances Perkins, Secretary of Labor, has publicly stated that there are three things all Americans want and must have in the post-war era. They are: I. The *opportunity to work* and to produce the goods that human beings need. II. *Security* from adversity when the chance to work is cut off. III. *Opportunity* to equip oneself to function as a productive member of society and to share in its benefits.

These three essentials for all Americans call for a higher level of community service. Already, it is to be noted that health services and cooperatives are already beginning to spring up. One that I have observed has the full endorsement of the Medical Society of Greater New York and has ambitious plans to provide all manner of surgical and medical services, including eye service, and to do it in a group manner through industrial organizations. In this connection it is apt to quote Henry Robinson, Associate Editor of READERS' DIGEST, writing in that publication for April, 1943. Mr. Robinson says, "Medical care costs money . . . more money than the majority of Americans can afford. The spector of medical expenses, which average $120 annually for family, haunts most homes. Even a minor illness perilously rocks the family budget. Yet such is the paradox in medicine that a few doctors get rich

and most hospitals operate at a deficit and meanwhile millions of sick human beings are not getting adequate treatment and physicians are increasingly fearful lest government-regulated medicine, with its cheerless bureaucracy, take over the medical care of the nation. Lighting this sombre picture are various health and hospital plans under which nearly fifteen million Americans receive some sort of medical care by paying from 2c to 10c a day. Like every other insurance, these plans 'spread the risk' so that the sick man's difficult financial burden is shared by those who are well."

Again, in the NEW YORK TIMES of May 4, 1943, we learn that the New York State Medical Society has taken steps to underwrite its own plan for socialized medicine. The article points out that a Committee of eleven has already been established to map out a long-range program. The doctors of New York State have stated that this is "the most important problem facing American medicine today" . . . "The adjustment of medical practice to the demands of a rapidly changing world is a 'must' " . . .

"The world is changing," Dr. Baur, President of the State Society stated, and added, "unless we are alive to this change and unless we try to direct these changes insofar as they affect the practice of medicine, we shall be left at the proverbial hitching post. Instead of leading, we shall be led. The medical profession must evolve a plan of its own and work and fight for its adoption. We must consider many factors in evolving our new policy, factors such as the distribution of physicians; requirements for licensure; the tendency of hospitals to get into the practice of medicine; the effect of 11 million men returning to civil life with their demands on a paternalistic government. Medical matters must be decided by medical men and changes in medicine must be led by physicians or there will be chaos and regression rather than smooth functioning and progress. Let us inform the public that we are in favor of good medical care for all; the freedom of choice of physician; that methods will be found to bring that good care to all; that whatever changes are necessary will be carried out under the guidance of the medical profession and not by governmental or lay agencies."

And what will happen in the field of eye care and optics in the world of tomorrow? No one knows. But certain basic facts and factors do stand out which may point the way. For example, several fundamental developments have already occurred as a direct result of the war.

First of all, the war has built a completely new army of eye-conscious men and women. For the first time, literally hundreds of thousands of men have discovered their eyes and their need for eye care. The screening job done by the army examiners has brought home to these men and women the blessings of better vision. As a result, the market for professional services and skills, after the war, will be much larger than formerly. Present-day soldiers will demand continued eye care and better eye wear. It is to be noted that one out of every 7 men now in the armed services has been equipped with eye glasses. These men will come back from the war needing more and better services and will therefore become one of the main bulwarks against a post war optometric slump.

Marshall Holcomb, President of the Travelers Insurance Company at Hartford, recently stated that the government insurance given to the boys at a reduced rate during the last war was regarded at first as a very serious negative act by insurance companies. Later, they discovered that the propaganda on behalf of insurance which this move had spread among the boys at the front and among their parents and relatives, resulted in millions of dollars worth of post-war insurance with practically no preliminary selling on the part of the insurance agents.

Again, the war has made American industry more eye-conscious than ever before in its history. In this respect, the Better Vision Institute has played no small part. The importance of eyes as the No. 1 production tool is daily being established. On all sides, key men in industry are recognizing the importance of good vision as a production factor from the viewpoint of better quality, higher output, fewer accidents, less absenteeism and greater economy.

In passing, it is to be noted that the vast army of workers now engaged on the industrial front are in possession of a tremendously speeded up spending power. This increased income, however, cannot be used up in the ordinary necessities and commodities of life such as clothes, shoes, cosmetics, smokes, edibles, etc. The money is in their pockets but spendable only for certain commodities and certain services. These services include professional eye care. Why shouldn't every industrial worker in America, therefore, now look to his eyes? If glasses are now being worn, new pairs are in order to replace the unsightly or outmoded glasses that have served for the years past. Moreover, why shouldn't a small portion of these available funds be put into extra pairs for special uses?

And so, to meet the present challenge of increased incomes and boomed markets, as well as the new expanded post-war market opportunities which seem inevitable, certain definite changes are noticeable on the horizon and when the war is over and industry again resumes its peace-time production it is reasonable to suppose that a 3-way eye program may be entertained as follows: 1. (a) A *protection* program for eyes. This will be an amplification of the present goggle program, as it concerns safety. (b) A *vision improvement* and conservation program. The primary problem of good seeing will be given first and full consideration by industrial and professional leaders of the future. (c) An *efficiency* program. Fitting the eyes and the man to the job on the basis of visual aptitudes, temperament, skills, etc., to the end that there is greatest efficiency, less spoilage, fewer accidents, less fatigue, etc.

2. The trend toward greater enrollments in the accredited optometric schools is already under way. This trend will be greatly accelerated after the war, as men return from the armed services and look to improve themselves in those fields which afford greatest opportunity.

3. Hand in hand with the increased enrollments will be the founding of new schools with new, enlarged and improved courses of study.

4. And so, too, by rapid steps there will come higher standards of optometric practice. The philosophy of true professional service will gain momentum. It will become a first requisite of all professional people to practice in true professional style, if public esteem and support are to be won and kept.

5. As a next step will come recognition of the optometric sciences and professions by other established schools of learning. And, of course, it is inevitable that greater collaboration between the optometric profession and science groups must come as a necessary fundamental step, if the profession is to meet the ominous challenge of governmental and lay agencies in the matter of eye services to the public. As professional collaboration and unity grows, so, too, will grow greater recognition and respect by the public of the true value of eye science and its services.

6. Important eye research centers will be established. With them will come eye training clinics and they will flourish as the result of the demands of industry and commerce. Similarly, new factors of physiological as well as psychological significance will enter the eye field and have a strong influence on the professional attitude and practice of the future.

In time it is conceivable that two main types of Ophthalmic service may gradually emerge. The one, as now, will call for professional services based on ability and reputation and selected according to one's individual discretion and judgment—and his ability to pay. The second type of Ophthalmic service which may gradually emerge will be of a cooperative, community nature. This service will bring the full professional services and skills and therapeutic devices to all families with incomes of $2,500 or less per year, and do it at a minimum of cost to these low income families.

The art of "face-planning" will gradually emerge as an adjunct of present Ophthalmic skills, and with it the cosmetic aspect of glasses will assume its true importance. Likewise, style in glasses will gain nationwide acceptance. Eyewear will join the fashion family of clothes, and shoes and hats and accessories and be subject to the same seasonal changes as these other items of adornment and utility.

The use of color in eyewear will become more widespread. Women of all ages and of all types have an inborn liking for color. And so, too, have men. As ensembles are more skillfully and scientifically planned to flatter one's personality and figure and type, the color of eyewear will change and change again. In this respect, new materials of a lighter more plastic nature will replace the old dyed-in-the-wool materials which have been used since glasses were first invented. These new materials will bring with them new factors of color adaptability, new beauty, new lightness and new durability.

And there will develop new spectacle wearing habits as a result of the forces which will come into play when industry and business and society have properly evaluated the place of glasses in the utility and adornment scheme. For example, there will be glasses strictly for outdoor use as well as others strictly for indoor use. There will be special glasses for specific industrial tasks as well as for specific domestic and social eye tasks. There will be special occasion glasses of many kinds; some for health wearing as well as for efficiency of seeing. Vitamins through the eyes is in the new order of things—through lenses that filter or multiply or subtract, as the doctor prescribes.

And what will the Better Vision Institute be doing? It is hoped that the Institute will be keeping pace with these new developments and aiding in every way possible the advancement of all engaged in Ophthalmic work. Currently, it is engaged in a wide-scale program of public

education on the theme, "VISION FOR VICTORY." This is a patriotic theme which is bound to contribute to the winning of the war by making eyes on the industrial front better fit to better do the important eye jobs assigned to them. Simultaneously, the Institute educational advertising is cultivating friendly public opinion. It is attempting to set the public mind straight and at ease. It is attempting to overcome misconceptions and prejudices which have grown up over the years. It is winning new esteem and new support for all engaged in eye work. As time goes on and as the scene changes, bringing forth new problems, the Institute theme will change. Later themes will keep up with later times. As the need develops, the subjects of professional performance and prestige, of style, design, color, fashions, will be presented as will be the story of the importance of eyes for specific industrial tasks.

As usual, all elements in this complex professional family of ours will get fair play in the national advertising program, along with the supplementary educational devices produced and sponsored to aid individual members such as folders, booklets, posters, films, radio programs, ads, etc. And, as time goes on, the Institute will undoubtedly produce fashion supplements, color guides, scientific brochures, research bulletins, and other promotions intended to keep pace with the times and to keep the industry in step with this ever-changing world.

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

by J. Fred Andreae, Secretary

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

COMMITTEE ON PROFESSIONAL PRACTICES AND STANDARDS

COMMITTEE MEMBERS

Dr. Irvin M. Borish
Dr. Richard Hall
Dr. Glenn Fry
Dr. Carel Koch
Dr. Don Paine, *chairman*

This committee constitutes the Editorial Board which will review all of the committee's material prepared for publication and dissemination.

MOTIVES WHICH PROMPTED THE PLAN

Professional Optometry is crucially aware of the value to optometry in gaining a more favorable professional recognition by the govern-

ment, the educational system, the allied professions, the scientific world, and the public at large.

To gain such ends there is impelling evidence that along with educational advancements more universal practice standards of a professional status must inevitably be adopted by optometry.

Because one of the Academy's objectives, of traditional importance, is that of high ethical and professional practice standards, and since the time is psychologically ripe for such a movement—the Academy will lend its influence (in keeping with Academy tradition) entirely independent of any other program, by setting forth the Academy's concept of professional practices and the value of such standards to the individual, to the profession as a whole, and to public welfare.

FUNCTIONS OF COMMITTEE

Each member of the committee is herewith assigned the duty of writing on such phases of professional practice as he cares to select, and is further called upon to solicit such articles among carefully chosen students of the subject toward the end that there be a continuous flow of such material.

This material is to be first submitted for review to the Editorial Board (committee personnel) and such material as is favorably passed will be published in the ARCHIVES OF THE ACADEMY.

The ultimate value of influencing a greater number of optometrists to practice according to the Academy's ethical and professional standards depends upon (1) the character of the material and (2) the numbers that are reached.

As to (1) the character of the articles, it stands to reason that along with highly important academic and abstract articles which deal with the most conventional and historical ideals on professionalism we will, without lowering any standards, be realistic enough to phrase some of our material in a manner which will appeal forcefully and convincingly and will thereby be understood and appreciated by those we endeavor to reach.

As to point (2) that of reaching more potential readers, your Chairman suggested following the Executive and Advisory Council meeting in Cleveland, the plan of having reprints of these articles, following publication sent to all optometric practitioners in the nation. If this plan is approved (the Council has already approved the original

over-all plan) such steps can immediately follow publication of the articles under discussion. If such a plan of wide distribution is not pursued, we will place very drastic limits on reaching those we wish to reach and the final outcome would thereby be highly questionable.

CONCLUSION

These steps are the initial steps in this program of extending Academy influence directed toward more widespread professional practices. As to any future steps will depend upon the discretion of the Academy's ruling body which will be influenced by the success or failure of this initial step.

DON RODNEY PAINE, *Chairman*

ABSTRACT

A department in which will appear abstracts of the literature of optometry, ophthalmology and applied optics. These will be classified according to the following list, although contributions to all sections will not necessarily appear in each issue.

1. Ocular Refraction.
2. Physiological Optics and Color Vision.
3. Ocular Muscles.
4. Orthoptics and Reading.
5. Anatomy, Histology and Embryology.
6. Ocular and General Pathology.
7. Ophthalmic Lenses and Material.
8. Instruments.
9. Hygiene and Illumination.
10. Applied and Physical Optics.
11. Education, Sociology and Economics.
12. Miscellaneous.

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1. OCULAR REFRACTION

MULTIPLE EXAMINATION PROCEDURE. C. W. Morris. Optical Journal and Review of Optometry. 1943, 80, 5, 18-19.

Morris points out that the important fact is not the status of an eye today but rather the knowledge of the amount and direction of change as evidenced by comparison with a previous examination a week, a month, or a year ago.

His second principle is that data from an examination made upon a pair of eyes under strain are influenced by the amount and character of the strain. Upon the second examination, after the use of a temporary correction, one may find very significant changes.

His third point is that the capacity of an individual to correct or neutralize an error is a variable, dependent upon many factors such as health, working conditions, and age. This habit of compensation for an error is ordinarily well established.

Morris presents briefly the three physiological principles upon which we rationalize the satisfactory results obtained by the double examination procedure and the use of temporary or treatment correction. The value of the determination of the speed and direction of ocular changes; the value of the elimination of the factor of fatigue, and the responsibility upon the optometrist accurately to determine what portion of the absolute error can be corrected, make the employment of the temporary correction and the multiple examination procedure worthy of consideration. C. C. K.

BINOCULAR REFRACTION. A. King. Optical Journal and Review of Optometry. 1943, 80, 6, 23-24.

King suggests the use of the binocular fogging test to disclose the full amount of hyperopia. He finds that the test carried out binocularly, rather than monocularly, will usually get the patient to accept from + 0.50 D to + 1.00 D additional. L. P.

FUNDAMENTAL VARIABLES IN THE RELATIONSHIP BETWEEN ACCOMMODATION AND CONVERGENCE. G. A. Fry. Optometric Weekly. 1943, 34, 6, 153-155.

Fry outlines the usefulness of a graphical analysis of the data obtained in a routine examination that pertain to accommodation and convergence. The relationships between accommodation and convergence are demonstrated to involve several fundamental variables. Once the findings are analyzed in terms of these variables, the reason for the anomalies in the relationship between accommodation and convergence can be more fully appreciated.

Furthermore, the type of graphical analysis which is recommended makes it possible to check findings obtained in a routine examination against each other to determine what findings involve experimental errors. The following findings can be plotted on the graph: I. Tests at 6 m. with the subjective. (a) Lateral phoria. (b) Base in to break. (c) Base out to blur and break. II. Tests at 40 cm. with the anticipated near point correction. (a) Lateral phoria. (b) Base in to blur and break. (c) Base out to blur and break. (d) Plus lens to blur. (e) Minus lens to blur. III. Near point of convergence. (Push up method.) IV. Monocular amplitude of accommodation. (Push up method.)

T. O. B.

DETERMINATION OF AXIS AND AMOUNT OF ASTIGMATIC ERROR BY ROTATION OF TRIAL CYLINDER.

Archives of Ophthalmology. 1942, 28, 4, 632.

When an astigmatism is corrected by a cylinder at the wrong axis, a new astigmatic error results, the power and the axis of which depend on (1) the error in axis position and (2) the relative power of the correcting cylinder.

The larger the error in axis position, the larger is the resultant astigmatism, regardless of whether or not the correcting cylinder is right, while the axis of the resultant astigmatism shows a different and characteristic behavior contingent on whether the correcting cylinder is (a) right, (b) too strong or (c) too weak.

When the correcting cylinder is right the smallest rotation of the cylinder to one side throws the axis of the resultant astigmatism almost 45 degrees in the opposite direction, while a further increase of the error in axis position has almost no effect on the resultant axis.

When the correcting cylinder is too strong but is in the true axis, a new astigmatism with its axis 90 degrees to the axis of the original astigmatism is produced. The greater the relative overcorrection, the less will be the change in the axis of the resultant astigmatism when the axis of the correcting cylinder is rotated.

When the correcting cylinder is too weak and is in the true axis, part of the original astigmatism remains uncorrected. Rotation of the cylinder changes the axis of the resultant astigmatism but little, with a maximum inclination of this axis at a certain error in axis position.

It is shown that this behavior of the axis of the resultant astigmatism can be used as a most accurate subjective test for the refinement of the determination of an astigmatic error in conjunction with the astigmatic dial. **T. O. B.**

BIFOCALS FOR YOUNG MYOPES. E. P. Leonard. Kentucky Optometrist. 1943, 16, 11, 9-10.

In young myopes, the following four combinations of refractive findings indicate the use of bifocal corrections: (1) If the abduction (base in to break) at 20 feet is less than half the adduction (base out to break), and the abduction is less than the adduction at 16 inches, it

is a sign that bifocals are necessary and acceptable; (2) If the cross cylinder add, at near, over the subjective at 20 feet is high and there is little or no exophoria, through the cross cylinder finding, at near, it is another sign for bifocals; (3) If more plus than minus can be added on top of the subjective before the vision is blurred out on fine print at 16 inches, it is another sign for bifocals; (4) If the blur out point on fine print at 16 inches is lower with base in than base out, it is another sign of bifocals. T. O. B.

PATHOLOGICAL CASES. J. F. Hill. Bulletin of the Optometrical Society of the City of New York. 1942, 8, 2, 8-9.

"The ability of the average optometrist to detect pathology is often questioned by the medical profession. In actual practice the detection of pathological cases is not at all difficult—neither is it necessary for the examiner to have a full medical education to be able to 'screen out' those cases which require services other than optometric. Even without the use of the ophthalmoscope the optometrist can catch ninety per cent of pathological cases if he will give particular attention to small details. In every case he should listen carefully to the chief complaint of the patient, take a detailed case history, make a careful and accurate record of visual acuities and, as this case shows, include a muscle test at six meters as a routine part of his examination. While the *detection* of pathological cases is a relatively simple procedure, the *diagnosis* and *treatment* of these cases is a vastly different problem which requires the combined knowledge and experience of the highly trained ophthalmologist."

T. O. B.

IMPROVING COLOR VISION. C. Shepard. Optometric Weekly. 1942, 33, 45, 1253-1254.

"Many questions are being asked about 'color blindness' by laymen who have been rejected from some branch of the armed forces or refused employment because of this 'defect' and by optometrists who wish to know what procedures are followed and what results may be expected. Also, very positive statements are being made, for the most part quoting text books, such as 'Color blindness is a congenital defect

and in the true sense of the term is never acquired . . . There is no known correction for this condition despite the claims of some optometrists.'

"Investigation of certain claims; observation of cases in the Northern Illinois Clinic, in private practices and personal experience which such cases indicate the following to be a summary of factual evidence:

"(1) Of those individuals who have failed to pass the tests of color vision in current use in industry and the armed forces, and who have undertaken to improve their color vision under optometric direction, the majority show very definite and unmistakable improvement within a few days or weeks. Conservatively, 25 per cent acquire 'normal color vision' in terms of the tests in current use.

"(2) Sincere efforts have been made to follow up these cases with subsequent tests of color vision. Where subsequent tests have been made, from three weeks to a year later, no regressions have been discovered.

"(3) The methods employed in the cases on which these statements are based consist of two simple procedures which were employed separately in some cases and in combination in others: (A) The subjects were given bits of colored paper, etc., to match and to name. (B) The subjects were required to watch a fairly bright light flash on and off at about one second intervals, the light passing through filters which transmit red with some orange and yellow. There has been some variation in the timing, but the usual procedure has been for the subject to watch the flashing light for about three minutes; then rest, with the eyes closed and covered, for an equal period. In many instances the subjects have been encouraged to cultivate interest in colors, to look for colors everywhere." Shepard claims the procedure just outlined seems to be of some value. **C. C. K.**

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2. PHYSIOLOGICAL OPTICS AND COLOR VISION

FACTS OF COLOR BLINDNESS. D. B. Judd. Journal of the Optical Society of America. 1943, 33, 6, 294-306.

"Color-blindness is of various types, and there is a greater or lesser adherence of groups of observers to these types. The most common are the two types of red-green blindness, protanopia and deuteranopia, and the corresponding types of anomalous vision, protanomaly and deuteranomaly. Although red-green-blind observers should obviously be ex-

cluded from occupations requiring the ability to make red-green distinctions, there is doubt what to do with an observer proved to be anomalous because in spite of the fact that many anomalous observers have virtually no ability to distinguish red from green, others do so nearly or quite as well as normal observers.

"Color-blindness is usually congenital, but it may also be acquired as a result of injury or disease. Congenital red-green blindness and anomalous vision are much more prevalent among males than among females, and are regarded as sex-linked characteristics. Total color-blindness, however, is thought to be a simple recessive characteristic.

"Red-green blindness is designated as a reduction form of normal vision because two lights of whatever spectral compositions are required to produce a match for the normal observer will also be indistinguishable by a red-green-blind observer. Red-green weakness, or anomalous vision, on the other hand, is called an alteration form of vision, because such matches by the normal are frequently quite unacceptable to the anomalous observer. In spite of this it is possible to predict the brightness judgments of the anomalous observer with good validity from the normal specifications of the colors being dealt with, the chromaticity alone being unpredictable. Methods of predicting precisely the appearance of colors to red-green-blind observers are described with a view to their possible usefulness in the design and development of color-blindness tests."

A. V. F.

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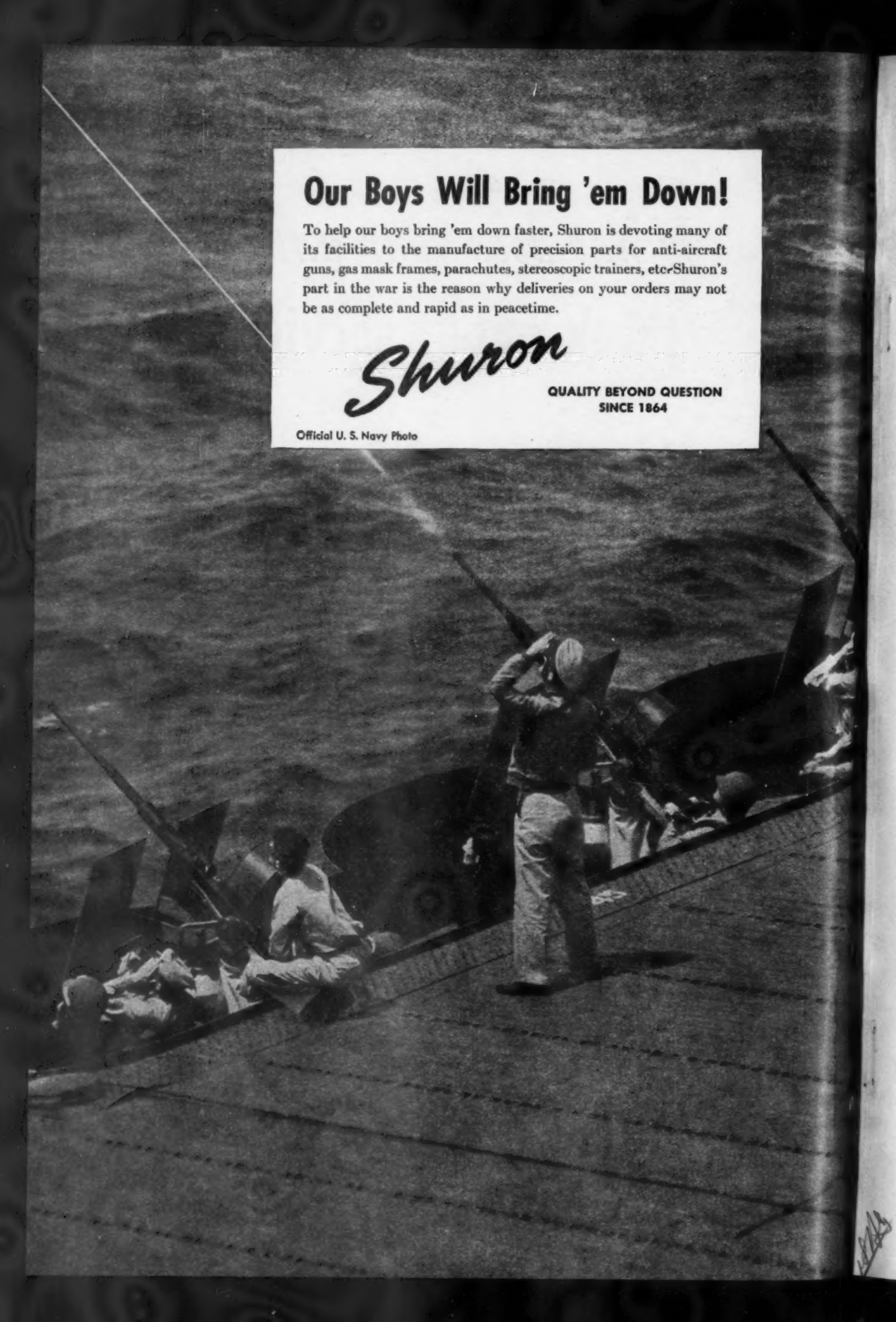

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